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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/038,512	10/19/2001	Soren A. Rasmussen	2954/1J910-US1	5999
7278	7590	10/05/2004	EXAMINER	
DARBY & DARBY P.C. P. O. BOX 5257 NEW YORK, NY 10150-5257			BARAN, MARY C	
			ART UNIT	PAPER NUMBER
			2857	

DATE MAILED: 10/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/038,512

Applicant(s)

RASMUSSEN ET AL.

Examiner

Mary Kate B Baran

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 13 May 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-40 is/are pending in the application.
- 4a) Of the above claim(s) 35-40 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-34 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☒ Claim(s) 1-40 are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 October 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election with traverse of claims 1-40 in the reply filed on 13 May 2004 is acknowledged. The traversal is on the ground(s) that the species set forth by the Examiner are all drawn to the same invention of automatic fault diagnosis. This is found persuasive; therefore, claims 1-34 are regrouped. As there were no arguments pertaining to the restriction requirement with regards to claims 35-40, the Examiner assumes that the requirement is still deemed proper and is therefore made FINAL.

### ***Priority***

2. Acknowledgment is made of applicant's claim for foreign priority based on an application filed in Denmark on 9 August 2001. It is noted, however, that applicant has not filed a certified copy of the foreign application as required by 35 U.S.C. 119(b).

### ***Drawings***

3. The drawings are objected to because:
- (a) Figures 1 and 2, depict boxes without labels. Applicant is asked to please label these boxes with text.
  - (b) Figure 3, the text "Equipment Configuration" and "Measurements DB" does not fit in the boxes provided.
  - (c) Figures 9-12, the labels, titles and text in these figures is illegible.

(d) Figures 1-13, are informal drawings with are suitable for examination purposes only; however, new formal drawings are requested.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

4. The abstract of the disclosure is objected to because: on page 31 line 7, "etc. ." should be – etc. –. Correction is required. See MPEP § 608.01(b).
5. The disclosure is objected to because of the following informalities:

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- (a) On page 7 line 8, "The or each" should be – Each –.
- (b) On page 12 line 9, "plant in according" should be – plant according –.
- (c) On page 12 line 30, "selected" should be – selected. –.
- (d) On page 12 line 32, "probes82" should be – probes 82 –.

Appropriate correction is required.

### ***Claim Objections***

- 6. Claims 6, 17 and 32 are objected to because of the following informalities:
  - (a) Claim 6 page 24 line 13, "stre" should be – strength –.
  - (b) Claim 17 page 26 line 22, "calculatng" should be – calculating. –.
  - (c) Claim 32 page 29 line 15, "machine," should be – machine. –.
  - (d) Claim 31 page 29 line 11, "operations, logics" should be – operations and logics –.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

- 7. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 31 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it

pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 31 discusses the use of “crisp” logic; however, this is not defined in the specification.

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 17, 31 and 33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 17 recites, “recording the classification of operation state together with the measured data in the reduced dataset and calculating”. It is not clear what the calculating is referring to, or what data could be generated from the calculation, which would then be recorded.

Claim 31 recites, “logics (crisp and fuzzy and descriptive decision theory)”. It is not clear if this list is intended to be exclusive, or merely citing examples of logics.

Claim 33 recites, “instantiating a diagnostic fault method object (local instance in a physical object)”. It is not clear if this language is intended to specifically define a diagnostic fault method object, or providing an example of a diagnostic fault method object.

9. Regarding claim 31, the phrase "such as" renders the claim indefinite because it is unclear whether the limitations following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

***Claim Rejections - 35 USC § 102***

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-11, 14-22 and 24 are rejected under 35 U.S.C. 102(e) as being anticipated by Quist et al. (U.S. Patent No. 6,199,018) (hereinafter Quist).

Referring to claims 1, 11 and 21 Quist teaches a method of automatic fault diagnosis including: for each of a plurality of components of machines, carrying out the steps of: for at least one possible fault in the component (see Quist, column 3 lines 27-35); calculating a total fault symptom strength value from measured data indicating the strength of the fault (see Quist, column 23 lines 21-35); and if the total fault symptom strength value lies above a predetermined value for that fault, recalling stored data relating to the total fault system strength value as a function of time (see Quist, column 22 line 57 – column 23 line 5), fitting the stored data relating to a trend line and predicting the time when the total fault symptom strength value will exceed a

predetermined value (see Quist, column 24 lines 14-18), selecting a message based on the total fault symptom strength value and the predicted time, and outputting the selected message (see Quist, column 5 lines 4-18).

Referring to claims 2 and 14, Quist teaches that the reduced dataset is stored in a database and the method further includes automatically taking measurements of the component when a predetermined condition occurs (see Quist, column 5 line 51 – column 6 line 6), calculating new reduced data, testing whether the new measurements represent a significant change on the reduced data stored in the signature database, and storing the new reduced data in the database if the step of testing indicates a significant change (see Quist, column 12 lines 24-39).

Referring to claims 3 and 15, Quist teaches that the method further includes classifying the operation state of the data, comparing the new reduced data with reduced data from the same operation state and storing the new reduced data in the database indexed by the operation state (see Quist, column 6 lines 7-20).

Referring to claims 4, 16 and 22, Quist teaches a method of automatic fault diagnosis for machinery having a plurality of components, based on a reduced dataset calculated from data measured on the machinery (see Quist, column 3 lines 27-35), the method comprising: for at least one machine component, and for at least one fault that may occur in that component (see Quist, column 3 lines 27-35), carrying out the steps



of: calculating for each of a plurality of symptoms for indicating that fault, a symptom value as a function of the reduced dataset calculated from measured data (see Quist, column 23 lines 21-35); combining the symptom values to give a total fault symptom strength value indicating the strength of the fault; and carrying out fault processing if the total fault symptom strength lies above a predetermined value (see Quist, column 24 lines 35-39).

Referring to claim 5, Quist teaches classifying the operation state of the machine and recording the classification of operation state together with the measured data in the reduced dataset and calculating the symptom values from data from selected classification states (see Quist, column 23 lines 6-35).

Referring to claim 6, Quist teaches that in addition to a symptom value representing the relative magnitude of deviation of measured values in an operation state from a baseline values in an operation state a symptom strength representing the size of the measured values is calculated for each of the symptoms (see Quist, column 22 lines 40-49).

Referring to claim 7, Quist teaches that the total symptom strength of a fault is calculated from a fuzzy minimum of symptom values corresponding to the fault (see Quist, column 3 lines 36-47).

Referring to claims 8 and 18, Quist teaches that if the total fault symptom strength for the fault lies below a first predetermined threshold, carrying out no further processing for that fault (see Quist, column 5 lines 4-18), and if the total fault symptom strength lies above the first predetermined value switching, for the fault, from a first mode in which the value of the total fault symptom strength is not recorded on an ongoing basis to a second mode in which the total fault symptom strength is recorded on an ongoing time series basis (see Quist, column 23 lines 21-29).

Referring to claims 9 and 19, Quist teaches automatically starting a routine for checking the faults of a component at regular intervals, the routine calculating the total fault symptom values, and if necessary carrying out fault processing for each of a plurality of faults that may occur in that component (see Quist, column 4 lines 5-8).

Referring to claims 10 and 20, Quist teaches that the reduced dataset is stored in a database and the method further includes automatically taking measurements of the component when a predetermined condition occurs (see Quist, column 5 line 51 – column 6 line 6), calculating new reduced data, testing whether the new measurements represent a significant change on the reduced data stored in the signature database, and storing the new reduced data in the database if the step of testing indicates a significant change (see Quist, column 12 lines 24-39).

Referring to claim 17, Quist teaches code for classifying the operation state of the machine and recording the classification of operation state together with the measured data in the reduced dataset (see Quist, column 23 lines 21-27).

Referring to claim 24, Quist teaches a system for automatically outputting a fault diagnosis (see Quist, column 3 lines 27-35), including: a signal processing unit for measuring data and recording the measured data in a database (see Quist, column 12 lines 24-29); and a server for testing, for a plurality of fault conditions corresponding to one or more components, whether the measured data stored in the database indicates those faults (see Quist, column 22 line 57 – column 23 line 5), and outputting a text message identifying any faults detected and the likely time before the fault becomes critical (see Quist, column 5 lines 4-18).

11. Claims 23, 25-29, and 31-34 are rejected under 35 U.S.C. 102(e) as being anticipated by Schneider et al. (U.S. Patent No. 6,718,533).

Referring to claim 23, Schneider teaches a system for automatically outputting a fault diagnosis for at least one possible fault, including a hierarchical database including a number of general object classes corresponding to different types of machine component and the machine component program objects are specific instances of the general object class corresponding most closely to the machine component (see Schneider, column 11 lines 7-11), which specific instances inherit code relating to possible faults in the type of machine component from the general object class, the

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machine component program object including code for determining whether specific faults occur (see Schneider, column 13 lines 36-44).

Referring to claim 25, Schneider teaches an automatic machinery fault diagnostic method and procedure for machines or one or more components thereof, characterized by using a machinery fault class library including references to specific signatures calculated from signals acquired from sensors placed at specific locations on said machine (see Schneider, column 25 lines 21-40).

Referring to claim 26, Schneider teaches references to specific signatures for each fault class (see Schneider, column 13 lines 38-44).

Referring to claim 27, Schneider teaches using a combination of unique fault signatures measured at specific machine states (see Schneider, column 13 lines 38-44).

Referring to claim 28, Schneider teaches determining the machine states by virtual measurements in a signal processing unit or acquired from external systems (see Schneider, column 13 lines 20-35).

Referring to claim 29, Schneider teaches determining the machine states by virtual measurements in a signal processing unit by using a predetermined monitoring

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strategy as to when and how often to collect data (see Schneider, column 12 lines 23-36).

Referring to claim 31, Schneider teaches using a fault class method in terms of a formal diagnostic language comprising mathematical operations or logic (see Schneider, column 12 lines 15-21).

Referring to claims 32 and 33, Schneider teaches instantiating a diagnostic fault method object per signature, per component, per machine, adapted by entering machine specific information (see Schneider, column 11 lines 8-15).

Referring to claim 34, Schneider teaches a diagnostic class method being editable in terms of modifications and expansions; modifications being instantaneously applied to associated object methods.

### ***Claim Rejections - 35 USC § 103***

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Quist et al. (U.S. Patent No. 6,199,018) (hereinafter Quist) in view of Schneider et al. (U.S. Patent No. 6,718,533) (hereinafter Schneider).

Referring to claim 12, Quist teaches all the features of the claimed invention except that a machine component object is provided for each of the machine components for which autodiagnosis is performed.

Schneider teaches that a machine component object is provided for each of the machine components for which autodiagnosis is performed (see Schneider, column 11 lines 7-11).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Quist to include the teachings of Schneider because associating a machine component with an object-oriented class would have allowed the skilled artisan to model the system (see Schneider, column 4 lines 37-49).

Referring to claim 13, Quist teaches all the features of the claimed invention except that the program includes a number of general object classes corresponding to different types of machine component and the machine component objects are specific instances of the general object class corresponding most closely to the machine component, which specific instances inherit code relating to possible faults in the type of machine component from the general object class.

Schneider teaches that the program includes a number of general object classes corresponding to different types of machine component and the machine component

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objects are specific instances of the general object class corresponding most closely to the machine component (see Schneider, column 11 lines 7-11), which specific instances inherit code relating to possible faults in the type of machine component from the general object class (see Schneider, column 13 lines 36-44).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Quist to include the teachings of Schneider because using objects associated with components and faults would have allowed the skilled artisan to model the system (see Schneider, column 4 lines 37-49).

13. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schneider et al. (U.S. Patent No. 6,718,533) (hereinafter Schneider) in view of Quist et al. (U.S. Patent No. 6,199,018) (hereinafter Quist).

Referring to claim 30, Schneider teaches all the features of the claimed invention but does not teach using an event controlled data communication strategy from said signal processing unit for communication with a server, only data including new information being communicated to said server.

Quist teaches using an event controlled data communication strategy from said signal processing unit for communication with a server, only data including new information being communicated to said server (see Quist, column 5 line 51 – column 6 line 6).

It would have been obvious at the time the invention was made to one of ordinary skill in the art to modify Schneider to include the teachings of Quist because sending

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new data to the server would have allowed the skilled artisan to generate updated comparison data for use in determining and predicting the operation and failure of the machines (see Quist, column 5 line 62 – column 6 line 6).

### ***Conclusion***

14. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- (a) Eryurek et al. teach remote analysis of process control plant data.
- (b) Quentin et al. teach a system to assess the starting performance of a turbine.
- (c) Graf et al. teach a circuit configuration for controlling a running-gear or drive system in a motor vehicle.
- (d) Harrison teaches a neural network based analysis system for vibration analysis and condition monitoring.
- (e) Werbos teaches a stochastic encoder/decoder/predictor.

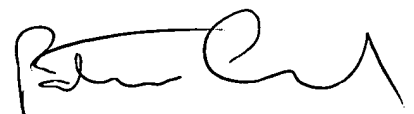
15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mary Kate B Baran whose telephone number is (571) 272-2211. The examiner can normally be reached on Monday - Friday from 9:00 am to 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marc S Hoff can be reached on (571) 272-2216. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.



Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

29 September 2004



PATRICK ASSOUD  
PRIMARY EXAMINER